

REMARKS/ARGUMENTS

In response to the Office Action mailed May 30, 2006, Applicants amend their application and request reconsideration. No claims are added or cancelled in this Amendment, so that claims 1-9, 11, and 15 remain pending.

In response to the Examiner's request for a more descriptive title, a substitute title is supplied.

Claim 1 was objected to as unclear with regard to whether the claim is referring to "the time of outputting of zero-voltage vector is zero or...claiming the time of outputting of the zero-voltage is longer than zero." Careful consideration of the patent application shows that the reference in the claim, which can be derived from the language of the claims themselves, to "time" in relation to the voltage vector refers to the duration or time interval of outputting of voltage vectors, including the zero-voltage vector. Further, by considering the description of the second embodiment of the patent application, and claim 2 before entry of the Preliminary Amendment, it is apparent that reference is being made in the claims to making the duration of the zero-voltage vector zero. Attention is directed to the paragraph beginning on page 28 in line 2, the remainder of the description concerning the second embodiment through part of page 31 of the patent application, and Figure 15 of the patent application. In Figure 15, attention is directed to step ST21 showing, as one of the alternatives of the path of the flow chart, the setting of the durations of the zero-voltage vectors $t_{0'}$ and $t_{7'}$ to zero. In order to make what is claimed clearer, claim 1 is amended to explain, as is apparent from the specification and a reasonable interpretation of the language of claim 1 as examined, that the duration of the zero-voltage vector is either longer than a minimum fixed time or is zero. It would appear that the interpretation made by the Examiner of the pertinent language of claim 1, while understandable, was not the interpretation supported by the specification and, as a result, the examination has gone in an incorrect direction.

Claims 3 and 4 were rejected as indefinite. The rejection is correct and resulted from a translational ambiguity. Claims 3 and 4 are corrected to be consistent with claim 1 from which those claims depend.

It is apparent that there is no misunderstanding or lack of understanding concerning the basic invention. The invention pertains to an apparatus employing pulse width modulation. The apparatus generates signals for controlling gated semiconductor switches. The switches are controlled in opening and closing in order to generate a multiphase electrical signal, for example, for driving a motor as illustrated in Figure 1 of the patent application.

In the invention, a voltage-vector control unit receives voltage instruction values for the power converter and determines, based upon those instruction values, voltage vectors to be output from the power converter. The voltage vectors, in the pulse-width modulation control that is employed, determine the duration of the output of the voltage vectors. The voltage-vector adjusting unit adjusts the duration of the output of the various voltage vectors including a zero-voltage vector which has a magnitude of zero.

An important feature of the invention, as described in claim 1, is that this adjusting unit adjusts, which means changes, the duration of the output of the zero-voltage vector to ensure that either that duration is longer than a fixed time, meaning a minimum time, or that the duration is zero, meaning that there is no zero-voltage vector output. Examples of adjustments are illustrated in the flow charts in Figures 9 and 15. In the step ST11 of Figure 9, if the sum of the durations of the zero-voltage vectors, the durations being t_0 and t_7 , is less than a fixed time, then the adjustment of the durations is made, as illustrated in the step ST13. If the duration is longer than the minimum duration, then no adjustment is made, as indicated in the step ST12. As already mentioned, a more complex arrangement is illustrated in the flow chart of Figure 15, which adds a further alternative, based upon a further test. According to that alternative, in addition to adjusting the duration of the zero-voltage vector, that duration may be set to zero depending on the threshold tests applied.

Finally, in the apparatus according to claim 1, a firing-pulse generating unit actually turns on and off the semiconductor switching elements based upon the voltage vectors generated with the adjusted durations.

Dependent claims 2, 5-7, 11, and 15 were objected to but not rejected. It is assumed that the correction of claims 3 and 4 makes those claims merely objected to and no longer rejected. Therefore, there is no further comment on any of claims 2-7, 11, and 15.

Claim 1 and its dependent claim 8 were rejected as anticipated by Rouaud et al. (U.S. Patent 5,685,688, hereinafter Rouaud). This rejection is respectfully traversed.

In citing Rouaud, the Examiner relied upon its Figures 4 and 5 and what was characterized as paragraph 12, although the paragraphs of Rouaud are not numbered. It is understood the Examiner was relying upon a paragraph beginning in column 8, line 27 of Rouaud. Applicants agree that Rouaud is pertinent prior art. However, Rouaud cannot anticipate claim 1 because Rouaud does not describe either adjusting the duration of any zero-voltage vector nor ever making, alternatively, the duration of the zero-voltage vector zero. Of course, with the interpretation of the language of the examined claim made by the Examiner, namely that the adjustment of the duration of the zero-voltage vector to be "longer than a fixed time that is zero" led to the rejection for anticipation. The passage of Rouaud relied upon, based upon the interpretation made of claim 1, clearly states that, in the inverter, the output potential never switches from positive to negative without first switching to a zero output potential. Thus, Rouaud excludes the possibility that the duration of the zero-voltage vector could be zero as specified in claim 1.

In order for Rouaud to anticipate the other alternative limitation of claim 1, namely that the duration of the zero-voltage vector is adjusted to be longer than a fixed time, Rouaud would have to describe adjusting that duration. Rouaud does not include such a disclosure. In fact, the entire description of the inverter switching that begins in column 10, line 1 of Rouaud demonstrates that there is never a change, i.e., adjustment, in the duration of the zero-voltage vector. Rouaud recognizes that

switching times are variable depending upon the amount of charge to be discharged and other circuit factors. One way of potentially adjusting switching times to account for this variability might be adjusting the duration of various output voltages.

However, Rouaud never suggests such an adjustment. Rather, Rouaud describes supplying a supplemental current to complete the commutation, i.e., switching, of the switching devices in the desired time. This concept is contrary to and cannot suggest the invention as defined by claim 1. It follows that Rouaud cannot anticipate claim 8, which depends from claim 9.

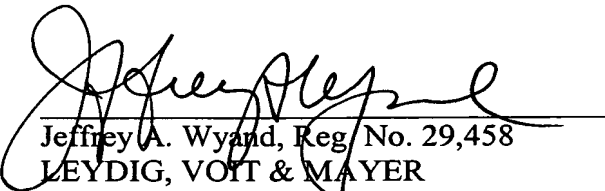
Claims 1 and 9 were rejected as anticipated by Kerkman et al. (U.S. Patent 5,912,813, hereinafter Kerkman). A significant number of patents to Kerkman have been cited in the prosecution of this patent application. Appreciation is expressed to the Examiner for identifying the particular Kerkman patent relied upon in rejecting claims 1 and 9 since that reference was not correctly identified at page 4 of the Office Action. The rejection of claims 1 and 9 is respectfully traversed.

In making the rejection based upon Kerkman, the Examiner directed attention to Figure 6f and a time period t13 representing a time period when the zero-voltage vector is output as the line-to-line voltage having a zero magnitude. Of course, that time period t13 is not zero in that Figure 6f as is apparent from inspection of that figure. Again, the interpretation made by the Examiner is understood, but is based upon a misinterpretation of the language of examined claim 1, which is now clarified. The interpretation made was not consistent with the example of Figure 15 of the patent application. Thus, the way Kerkman was applied to claim 1 was incorrect. Accordingly, reconsideration and withdrawal of that rejection are respectfully requested.

Claim 9, which depends from claim 1, was rejected as anticipated based upon the assertion that claim 1 is anticipated by Kerkman. Because that rejection was based upon the misinterpretation of potentially unclear claim language that has been clarified, the rejection of claim 9 should likewise be withdrawn.

Since the foregoing Remarks demonstrate that all claims now pending are allowable over the prior art applied in rejecting three of the claims, reconsideration and allowance of all pending claims are earnestly solicited.

Respectfully submitted,


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